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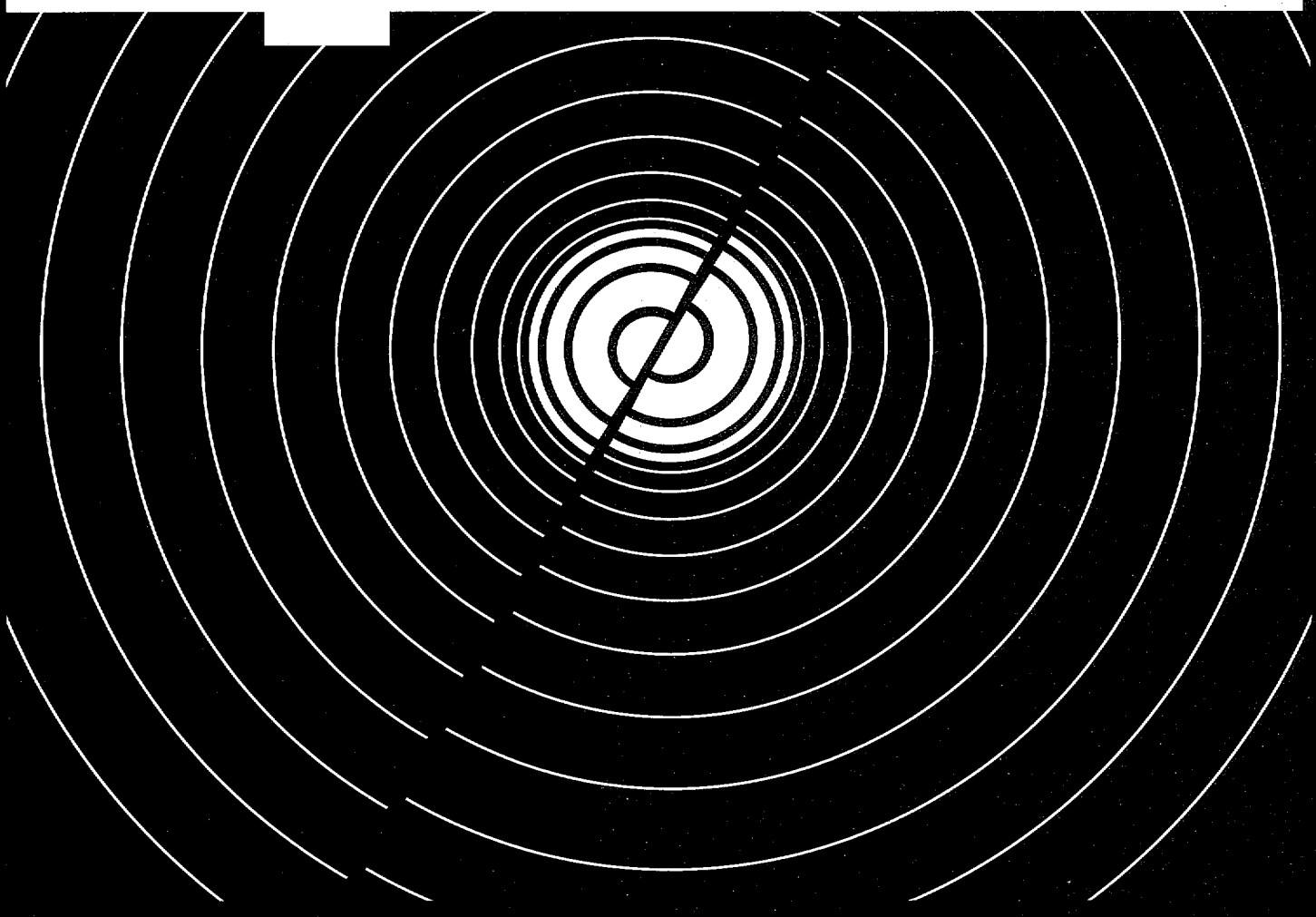
Promoting the Adoption and Enforcement of Seismic Building Codes:

A Guidebook for State Earthquake and Mitigation Managers



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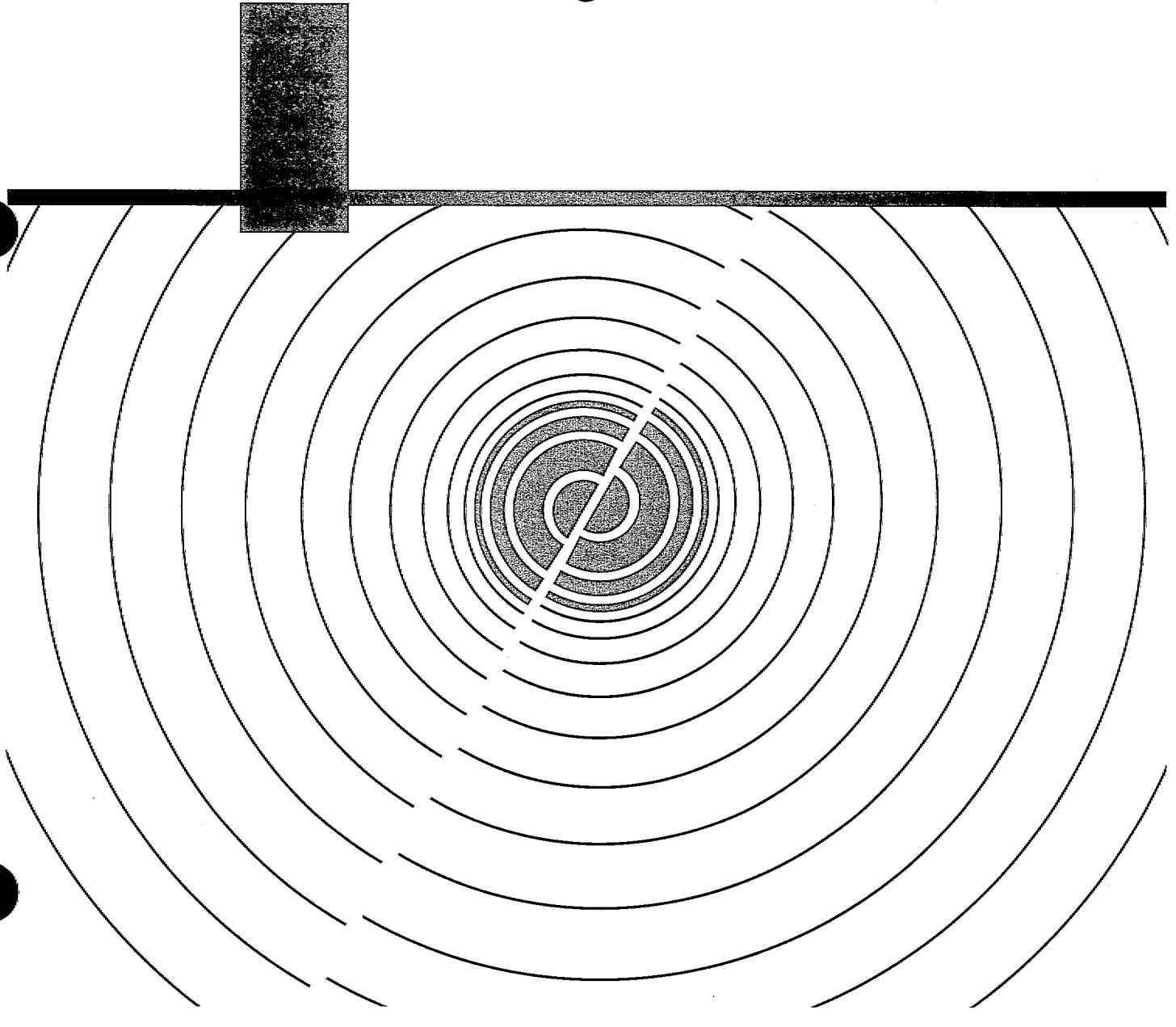

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Contents

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Figures and Tables

Chapter 1
How To Use This Book

Purpose

This book provides background information and educational materials to help state officials promote the adoption and enforcement of state and local model building codes that contain the latest seismic provisions. These codes can reduce the damage that will inevitably occur when future earthquakes strike at-risk parts of the country.

Audience

This book is intended for state officials, especially for earthquake program managers and hazard mitigation officers in the emergency management agencies of the states and territories prone to earthquakes. It is designed to help you convince your state and local governments that codes are effective, inexpensive, and a good investment for the future of our communities.

Additionally, this book is designed to be of use to local officials, state legislators, professional organizations, and concerned citizens. Portions of this book are meant to be copied and distributed to these various groups.

Content

Chapters 2 and 3 of this book contain background material on the purpose, function, and effectiveness of building codes in general and seismic codes in particular. Chapters 3, 4, and 5 describe step-by-step processes for adopting state or local codes and for administering codes. Several appendices contain:

- the history and principles of seismic design
- current seismic design practices in the United States
- examples of state building code requirements
- examples of state legislation
- examples of local code administration
- the services of the three model code organizations in the United States
- sources of further information and addresses
- recommended readings
- educational material for making local presentations
- sample press releases for the media
- sample brochures aimed at local audiences
- a glossary of relevant terms

Chapter 2
Why Adopt A Building Code?

Building Codes Protect Public Safety

Building codes regulate building construction and use in order to protect the safety and health of occupants. Codes address structural integrity, fire resistance, safe exits, lighting, and ventilation. Codes also regulate construction materials.

Building codes classify structures by use and apply different standards to each classification. For example, office buildings and residential multi-unit buildings are in separate categories with different performance requirements.

The validity of building codes is based on state police powers, which allow regulation of activities and property to preserve or promote the public health, safety, and general welfare. Zoning ordinances and environmental protection regulations are also founded in police powers.

FIGURE 2.1 The first building codes were designed to improve substandard housing. (Photo: Presidents Commission on Urban Housing, 1968)

Building Codes Have a Long History in the U.S.

Building codes to reduce the loss of life, limb, and property have existed in North America since the seventeenth century. The earliest building regulations addressed problems resulting from dense urban construction, such as rapid spread of fire. New York City, then called New Amsterdam, first regulated chimneys and roofing material in 1648. These regulations were aimed at controlling the destructive force of fire in urban areas, as evidenced by London's 1666 fire, New York's 1835 and 1845 fires, and the great Chicago fire of 1871.

Comprehensive building regulations were introduced in the mid-1800s.[1] Building regulations were of two types: housing codes and building codes. Housing codes were intended to reduce the ill effects of residential overcrowding, and their introduction paralleled Europe's housing and sanitation reform. New York City in the late 1850s adopted a citywide housing code in order to provide air and light into dwellings and reduce the risk of fatal hazards. Chicago followed by passing its initial tenement housing ordinance in 1874. Building codes were later enacted to comprehensively specify construction methods and materials.

In 1905 the National Board of Fire Underwriters published a model

building law aimed at reducing fire risks.[2] The three model building codes used today were initiated between 1927 and 1950. The use of codes spread with the growth of new building across the country, particularly after World War II. By 1960 more than 60 percent of American municipalities had adopted building codes.

Model Building Codes

A model building code is a document containing standardized building requirements applicable throughout the United States. Model building codes are standards specifying the required performance of all structures. They are published by private organizations, whose voting members are government jurisdictions.

It is the policy of the federal government to rely on voluntary standards whenever feasible and to encourage employees to participate in voluntary standards-developing activities (OMB Circ. A-119).

The United States has three prominent model building code organizations: the International Conference of Building Officials (ICBO), which publishes the Uniform Building Code (UBC); the Building Officials and Code Administrators International, Inc. (BOCA), which publishes the BOCA National Building Code (BNBC); and the Southern Building Code Congress International, Inc. (SBCCI), which publishes the Standard Building Code (SBC). Each organization also publishes companion documents covering mechanical work, plumbing, fire protection, electrical work, energy, accessibility, and life safety codes.

Simple one- and two-unit residential structures also are covered by another model building code: the *One- and Two-Family Dwelling Code,* by the Council of American Building Officials (CABO). CABO is composed of the three model building code organizations: ICBO, BOCA, and SBCCI.

In addition to writing and updating the codes, the organizations offer a variety of support services, including such technical services as training seminars, code interpretation, technical and administrative publications, customized consulting, plan-checking services, videos, and software (see Appendix D). Each organization offers certification programs to allow skilled inspectors and plan reviewers to be recognized for their levels of knowledge and experience. For example, BOCA offers certification by examination in twenty-two categories and ICBO in nineteen categories. SBCCI offers four levels of certification in various categories to encourage professional growth through progressive levels of certification.

Membership in model building code organizations is open to governmental officials, private sector building and construction professionals, and students. Each member participates in varying degrees depending on membership classification. For all three organizations only active governmental members may vote. Typically, these are local and state officials responsible for enforcing the building codes.

The model building codes are revised periodically by a democratic process. Each organization allows the public to propose code amendments and hear testimony in meetings organized by the organization, so members and nonmembers are equal participants. Active members of each organization vote on revisions after final testimony is heard during their annual meeting. The content of the codes has become more similar over time, although they still address regional conditions and practices. The newest versions reflect a common code format so that similar topics can be found in consistently numbered chapters among the codes.

Although the code organizations have widespread membership, each organization's model building code

Building Code Timeline

1648	Chimneys and roofing materials regulated to prevent fire in New Amsterdam (now New York City)
1850s	(late) Comprehensive housing regulations introduced in NYC
1874	Tenement housing ordinance passed in Chicago
1905	Model building law published by NBFU
1906	San Francisco earthquake kills 3,000
1927	Uniform Building Code (UBC), with seismic provisions, first published by ICBO
1933	Long Beach earthquake kills 115
1935	Charles Richter devises magnitude scale for earthquakes
1940	Standard Building Code (SBS) published by SBCCI
1949	UBC contains first national seismic hazard map
1950	Basic Building Code (now the BOCA National Building Code) published by BOCA
1960	60% of American municipalities had adopted one of the model codes
1970s	Study of earthquake-resistant design provisions funded by NSF
1971	San Fernando earthquake kills 65
1972	CABO formed
1973	UBC revised because of San Fernando quake
1976	UBC includes new seismic provisions
1978	ATC releases ATC3-06 report
1979	BSSC formed
1985	FEMA releases NEHRP provisions for new buildings
1989	95% of American municipalities covered by codes; Loma Prieta earthquake kills 63
1990	EO 12699 requires all federal agencies to incorporate seismic resistant design in new buildings
1992	All three model codes require seismic designs consistent with NEHRP provisions; Northridge earthquake kills 57
1993	EO12699 provisions take effect
1994	EO 12941 establishes seismic standards for federally owned or leased buildings; ICC formed
2000	ICC codes to be finished

The ABCs of Model Building Codes

Building Officials and Code Administrators International, Inc. (BOCA). BOCA, headquartered in Country Club Hills, Illinois, was formed in 1915. Its first code, the BOCA Basic Building Code now titled the *BOCA National Building Code* (BNBC), was published in 1950 in an attempt to standardize existing codes. The BNBC is revised every three years, most recently in 1996, with a new edition due out in 1999.

International Conference of Building Officials (ICBO). ICBO was formed in 1922 to integrate various design requirements into one code. ICBO published its first model code, the *Uniform Building Code* (UBC), in 1927. ICBO, headquartered in Whittier, California, updates the UBC every three years. The latest edition was published in 1994.

Southern Building Code Congress International, Inc. (SBCCI). The third model building code organization, SBCCI was founded in 1940. Located in Birmingham, Alabama, it publishes the *Standard Building Code* (SBC). The SBC is updated every three years, most recently in 1994.

Council of American Building Officials (CABO). CABO was founded in 1972 by BOCA, ICBO, and SBCCI. The *One- and Two-Family Dwelling Code* applies to the construction, prefabrication, alteration, repair, use, occupancy, and maintenance of detached one- or two-family dwellings and one-family town houses not more than three stories in height.

Further information on these organizations and their services is included in Appendix D.

is predominantly adopted in one portion of the United States (Fig. 2.2). The BNBC is predominantly adopted in the northeast and north central states, the SBC predominates in the southern states east of the Mississippi, and the UBC is predominant in the western states, including Guam (see Figure 2.2).[3]

In addition, BOCA, ICBO, and SBCCI have moved forward on the development of a single model code, the International Building Code. On December 9, 1994, the International Code Council (ICC) was formed to develop a single set of comprehensive and coordinated national codes. The advantages of a single code are numerous. Code enforcement officials, architects, engineers, designers, and contractors can have consistent requirements that can be used across the country and around the world. Manufacturers can put their efforts into innovative products, instead of designing for all three regional codes. To date, the ICC has produced codes that address plumbing, mechanical systems, and private sewage disposal. The goal is for the complete family of international codes to be developed by the year 2000.

Compared to the Benefits, the Costs of Codes Are Small—and Uniform Codes Reduce Costs

There are two costs associated with building codes. One is the cost of additional material and quality of workmanship, and the other is the cost of administration and enforcement. In the studies cited below, research has shown that building codes do not significantly increase building cost, and adoption of statewide codes can help reduce the costs.

Criticism of the cost of building codes in the 1950s and 1960s centered around the inefficiencies of having numerous codes, inconsistently applied. Builders often were required to alter their construction methods and materials from one community to the next, which meant spending more time and money. A survey of Detroit area construction companies in 1966 found that use of nonuniform building codes throughout the metropolitan region increased housing costs approximately 4 to 11 percent.[4] In contrast, a 1953 study in the San Francisco Bay Area found that the restrictive effect of codes had been greatly overemphasized, and that only 1 percent of housebuilding costs could be attributed to code inefficiencies.[5]

University studies[6] based on 1967 and 1970 housing costs found that building codes increased the cost of housing by less than 2 percent, and up to as much as 5 percent for particularly restrictive codes.

To address these issues, the National Commission on Urban Problems in 1968 recommended more uniformity in building codes, including adoption of state building codes.[7] According to a 1989 Federal Trade Commission study, because of the widespread adoption of model codes, differences among codes no longer contribute to higher housing costs.[8] Thus, the impact of codes on housing costs has always been relatively small, and is decreasing as more localities adopt model codes.

Most States and Municipalities Have Building Codes

Constitutionally, states have jurisdiction over regulation of construction. As of 1996, the Institute for Business and Home Safety (formerly IIPLR) reported that 23 states mandate a model code or state code to cover all buildings,[9] relying mostly on local municipal enforcement and administration (Fig. 2.3). An additional 18 states and Washington, D.C., mandate the code for all buildings except one-family dwellings. Ten states do not have state-mandated codes.

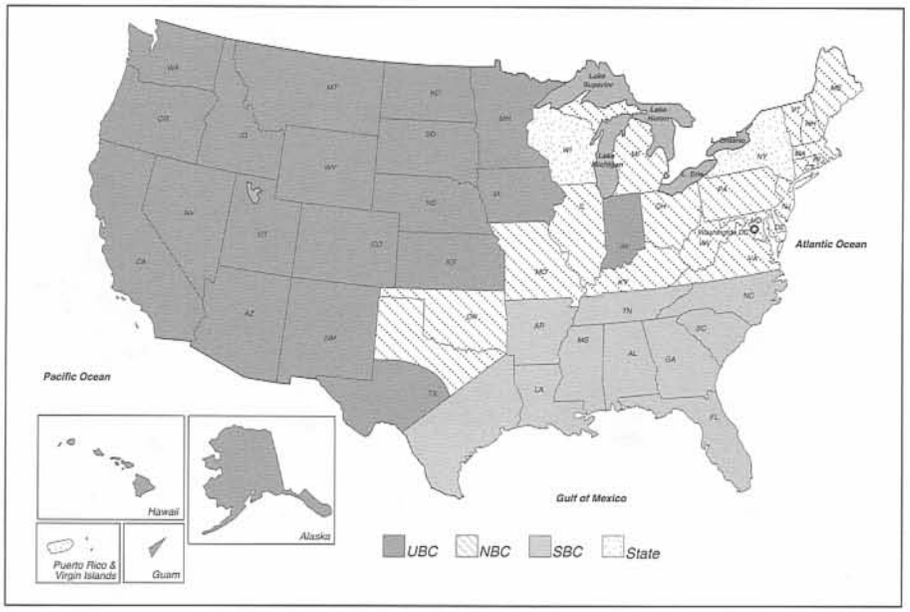
Currently two states, New York and Wisconsin, and one territory, Puerto Rico, have written their own building codes. Other states and territories that enforce statewide codes use one of the model building

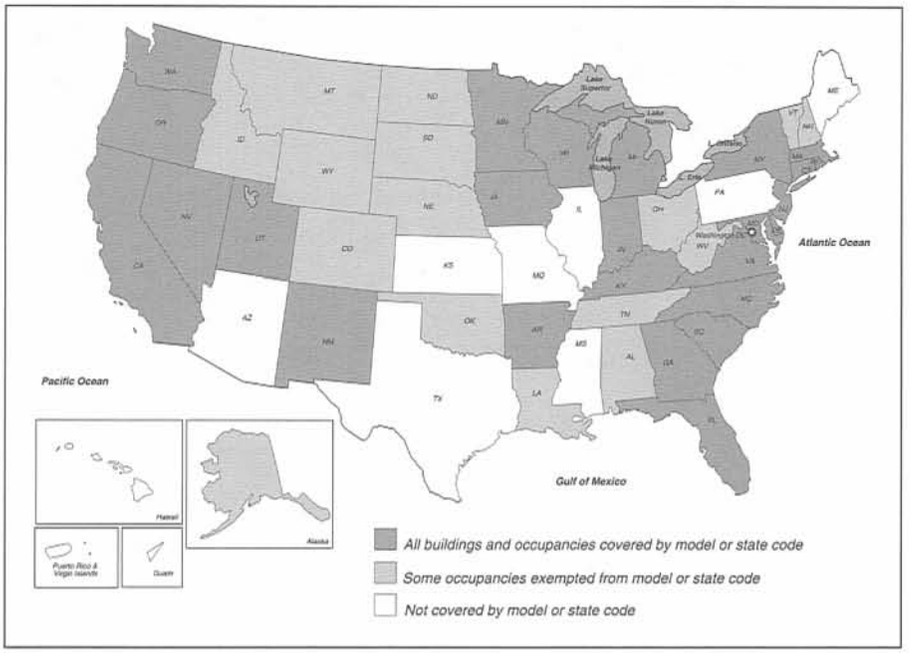
codes described previously. (See Appendix A for a list of current state and territory codes.)

Usually county and local governments adopt a model building code by ordinance. As of 1992, 44,000 local governmental units enforced building codes.[10] The Federal Trade Commission in 1989 estimated that 95 percent of all cities and towns are covered by building codes.[11] These local governments have either adopted a model building code or are covered by a statewide building code.

Codes Are Easy to Adopt

State and local governments usually adopt an entire model building code, though sometimes with minor revisions or deletions. Model building codes save governments the time and cost required to write an original code. They include sections detailing the administrative procedures for plan review, building inspection, plan and building approval, and code enforcement.





Top, FIGURE 2.2 General areas of building construction code influence. (Source: National Conference of States on Building Codes and Standards)

Above, FIGURE 2.3 States with mandatory statewide building codes. (Source: Copyright 1996, Insurance Institute for Property Loss Reduction [now IBHS])

NOTES

1 National Conference of States on Building Codes and Standards Inc., *Directory of Building Codes and Regulations*, Vol. 1, Code Primer, NCSBCS (Herndon, VA), 1989.

2 Ibid.

3 Ibid.

4 Metropolitan Fund, Inc., *A Study of Local Building Codes and Their Administration in the Southeast Michigan Six-County Region*, Public Administration Service (Chicago), August 1966.

5 Maisel, Sherman J., *Housebuilding in Transition*, University of California Press, 1953.

6 For 1967 costs, see Muth, Richard F., and Wetzler, Elliot, "The Effect of Constraints on House Costs," *Journal of Urban Economics*, Vol. 3, 1976, 57-67; for 1970 costs, see Noam, Eli M., "The Interaction of Building Codes and Housing Prices," *AREUEA Journal*, Vol. 10, 1983, 394-404.

7 U.S. National Commission on Urban Problems, *Building the American City*, report to the Congress and the President, House Document No. 91-34, December 1968.

8 Reported by Korman, Richard, "A Much Misunderstood Contraption," *Engineering News-Record*, June 22, 1989, 30-36.

9 Insurance Institute for Property Loss Reduction (now IBHS), *Summary of State-Mandated Codes*, IIPLR (Boston), April 1996.

10 National Conference on States on Building Codes and Standards, *Seismic Provisions of State and Local Building Codes and their Enforcement*, NIST GCR 91599, April 1992.

11 Korman, Richard; see note 8.